



THE
ONTARIO WATER RESOURCES
COMMISSION

REPORT

ON

GROUND WATER SURVEY

TOWNSHIP OF CARADOC AND EKFRID

COMMUNITY OF MELBOURNE

TD
403
.C37
1971
MOE

F. R. CAMPBELL

1971

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Report on a ground water
survey, township of Caradoc
and Ekfrid, community of
Melbourne / Campbell, F.R.
80662



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GROUND WATER SURVEY

TOWNSHIP OF CARADOC AND EKERID

COMMUNITY OF MELBOURNE

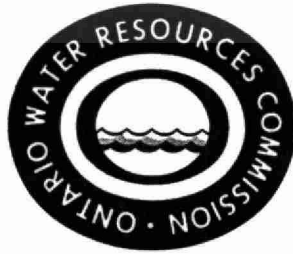
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survey, township of Carleton
and Oxford, community of
Melbourne / Cambridge, Fla.
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REPORT

ON

GROUND WATER SURVEY

TOWNSHIP OF CARADOC AND EKFRID

COMMUNITY OF MELBOURNE

F. R. CAMPBELL

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GROUND WATER SURVEY - TOWNSHIP OF CARADOC AND EKFRID
COMMUNITY OF MELBOURNE

INTRODUCTION

At the request of the Division of Project Development, the Division of Water Resources undertook a ground-water survey for the Community of Melbourne. The purpose of the study was to investigate the availability and quality of ground water in the Melbourne area as a possible source of municipal supply.

The study was limited to an area within a three-mile radius of Melbourne. The field work consisted of an examination of geologic and topographic features, the location of water wells and the collection of well-water samples to determine the ground-water quality in the area.

A summary of the water-well records from the files of the Division of Water Resources is shown in Table 1. The locations of these wells are shown in Figure 1. The well numbering code used in this report relates to the permanent coding numbers of the OWRC.

PRESENT SUPPLIES AND WATER REQUIREMENTS

The residents of Melbourne obtain water supplies from individually-owned dug and drilled wells.

The present population of the Community of Melbourne is 311. Assuming an average annual increase of 3 per cent, the population would be approximately 560 at the end of the 20-year design period ending in 1990. By further assuming an average-day water demand of 70 gallons per capita and a maximum-day to average-day demand ratio of 3 to 1, a supply capable of yielding a maximum-day demand of 80 gpm would be required by Melbourne in 1990. Storage would have to be provided to meet peak hourly and fire flow demands.

GEOLOGY

Bedrock

The bedrock in the area is comprised of thick beds of grey and bluish, soft shale interbedded with beds of grey and bluish semicrystalline limestone. The bedrock is Middle Devonian in age and belongs to the Hamilton Group of formations which has been described by Sanford¹ as follows:

Hamilton Group of Formations

- Ipperwash formation - grey argillaceous and crinoidal limestone
- Widder formation - alternating grey shale and argillaceous limestone
- Hungry Hollow formation - greyish tan crinoidal limestone and grey shale
- Arkona formation - soft grey shale and mudstone
- Rockport Quarry formation - grey argillaceous limestone
- Bell formation - soft grey shale

¹ Sanford, B.V., Geology Toronto-Windsor Area, Ontario
Map 1263A, Geological Survey of Canada, 1969.

The total thickness of the group of formations is approximately 280 feet.

The elevation of the bedrock surface varies from about 594 feet to less than 529 feet above mean sea level. Glacial scouring and/or fluvial action have formed a bedrock depression about one mile west of Melbourne. The depression has the form of a wide shallow valley which trends in a north-south direction.

Overburden

The overburden in the Melbourne area is Pleistocene in age and consists mainly of glacio-lacustrine clay and glacial till with minor amounts of sand and gravel. The surface topography in the area is very flat due to the controlling clay plain physiography and changes in the overburden thickness are controlled by changes of the bedrock topography. The overburden thickness varies from 80 feet in the northern part of the study area to 180 feet in a bedrock depression about one mile west of centre of the community.

A relatively thin sheet-like sand and gravel bed underlies the clay and till deposits and overlies the bedrock surface throughout the area. Gravel is predominantly found in the bedrock depression while sand deposits are found on the flanks of the depression. The sand deposits appear to be only about 10 feet

thick but the full section of gravel in the centre of the study area has not been penetrated and thus its total thickness is unknown. Other deposits of fine sand and sand and gravel occur as isolated lenses and beds within the predominantly clayey overburden sediments.

A geologic cross-section which shows an interpretation of the overburden geology in the area is presented in Figure 2.

HYDROGEOLOGY

Bedrock

Of the 23 wells for which records are available, only two obtain supplies from the bedrock. Both of these wells obtain supplies from an upper, fractured or weathered zone in the bedrock which may act as a collector system for water stored in the overlying clays and sands. The specific capacities of these wells are extremely low at 0.05 and 0.007 gallons per minute per foot of drawdown and their calculated theoretical yields are less than 5 gpm. Regionally, the bedrock is not a good aquifer and consequently it is not considered to be a possible source of municipal supply.

Overburden

The lenses and beds of sand and gravel and fine sand which occur as isolated deposits in the predominantly clayey

overburden often yield sufficient water for domestic purposes, but, because they are limited in areal extent and enclosed in relatively impermeable sediments, it is unlikely that they are capable of yielding municipal supplies.

The basal sand and gravel bed shown in Figure 2, is likely the only aquifer in the area which may be capable of supplying the requirements of the community. Specific capacities of domestic wells constructed in this aquifer range between 0.5 and 1 gpm/ft. of drawdown. The available drawdown in a well developed in this aquifer can be expected to be at least 130 feet. With proper development, the specific capacity of a municipal supply well can be expected to be greater than those of the private wells in the area.

WATER QUALITY

Samples from eight overburden wells were collected to determine the general chemical and bacteriological characteristics of the ground water in the area. The analyses results are shown in Table 2.

The water from the basal sand and gravel aquifer is slightly salty and contains large concentrations of iron and total dissolved solids. The chloride concentrations of the well-waters from this zone varied from 199 ppm to 338 ppm while concentrations

of iron and total dissolved solids varied from 0.25 to 1.1 ppm and from 500 to 690 ppm, respectively. The OWRC recommended maximum limits for chloride, iron and total dissolved solids are 250ppm, 0.3 ppm and 500 ppm, respectively.

The relatively high concentrations of chloride present appear to be a natural occurrence likely due to the proximity of the aquifer to the underlying marine shales.

FAVOURABLE TEST DRILLING AREAS

Areas favourable for test drilling have been selected on the basis of the following considerations: the proximity of the sites to the community, the nature and areal extent of the water-bearing zone, the reported yields, specific capacities and available drawdowns of the wells in the area, the quality of the ground water and the ease of access. Favourable test drilling areas are shown in Figure 1.

Area 1

Area 1, in the vicinity of wells 736 and 768, is located within the community of Melbourne. The 180-foot thick sequence of sands, clays and gravels overlying the bedrock may only yield small quantities of water, but, as there is only limited deep well information in the area and because tie-in costs would be minimal, two test holes within the community are warranted.

Area 2

Area 2, in the vicinity of well 742, is located about 1½ miles west of the centre of Melbourne. This area appears to offer the best prospects for developing municipal supplies. A sand and gravel aquifer, of unknown thickness, overlies the bedrock at a depth of 180 feet. Three test holes would be required to adequately test the aquifer in Area 2.

Area 3

Area 3, in the vicinity of well 741, is located about one-half mile west of the centre of Melbourne. Test drilling in Area 3 would be warranted if favourable aquifer conditions are encountered in Area 2 as pipeline costs could be reduced substantially. An interpretation of the sub-surface geology indicates that a 20-foot thick sand and gravel deposit may lie on the bedrock surface at a depth of 180 feet. Three test holes may be required to adequately evaluate the potential of the aquifer in this area.

COST ESTIMATE OF TEST DRILLING

The estimated cost of test drilling is \$20,000. A breakdown of the cost is as follows:

Mobilization and demobilization	\$ 1,000
Moving and setting up (60 hours)	2,250
Drilling (1500 feet)	8,100
Development (64 hours)	2,400
Pumping tests (72 hours)	2,500
Casing and associated materials	2,000
	\$ 18,250

In addition, funds would be required to cover the costs of items associated with test drilling but not covered in the contract. Such items include property options, ingress and egress facilities and the temporary restoration of water supplies which may be interrupted during drilling or test pumping. The allowance for the miscellaneous work is \$1,750.

CONCLUSIONS

(1) Ground-water conditions in the vicinity of the Community of Melbourne are sufficiently favourable to warrant test drilling for municipal supplies.

(2) Overburden aquifers of sand and gravel at a depth of approximately 180 feet appear to offer the best potential for yielding municipal supplies.

(3) The chemical quality of the ground water is generally not considered to be acceptable for municipal purposes because of high concentrations of chlorides and iron. Treatment for the removal of iron is possible, however, no economical method to remove chloride is presently available. This quality problem appears to be regional in nature and ground water of better quality does not appear to be available.

(4) The favourable test-drilling areas lie at distances of up to 1.5 miles from the community. Areas beyond this radius were not considered for test drilling because lengthy and costly pipelines would be required to connect any municipal well or wells to the community.

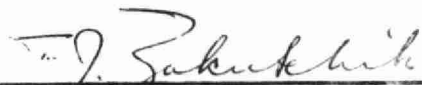
RECOMMENDATIONS

It is recommended that any test drilling by or for the Community of Melbourne be undertaken in the areas described in this report under the heading "Favourable Test Drilling Areas". A sum of \$20,000 should be provided for any test-drilling program. If favourable hydrogeologic conditions are encountered, pumping tests should be conducted to provide adequate data for the evaluation of the perennial yield of the aquifer and the degree of interference with existing domestic wells. During the test pumping, the chemical quality of the produced water should be monitored to detect possible changes in the quality of the water with respect to pumping time. These data can also be used to aid in the design of any water treatment facilities that may be required.

It would be necessary to provide for the restoration of a supply of water to residents beyond the serviced area whose wells were affected by the operation of any new municipal well to such a degree that an adequate supply could not be obtained from a well equipped with a shallow-well or deep-well pump.

Prepared by: F. R. Campbell, M.Sc., Geologist,
Surveys and Projects Branch.

FRC/ps
June 9/71


T. J. Yakutchik, Supervisor,
Surveys and Projects Branch,
Division of Water Resources.

ONTARIO WATER RESOURCES COMMISSION

 AREA OF SURVEY Middlesex

 COUNTY Middlesex

 TABLE OF WATER WELL RECORDS
Table 1

 DATE May 1971

 RECORDER B.M.

Well No.	Location			Owner	Driller	Well Type	Well Diameter INCHES	Depth Feet	Static Level Feet	Pumping Rate G.P.M.	Pumping Level Feet	Quality	Use	Remarks, Log, etc.
	Twp	Con	Lot											
684	EXFRID	II	3	Middlesex Turkey Farm	SMITH	●	5 1/2	73	35	10	46	F	Poultry	0-12 B.N. CL 12-35 B.N. Sd 35-54 B1 CL 54-60 Hd. Pan 60-63 Sd 63-67 * 63-67 67-73 Grv
683	"	II	1	D. Mennitt	JONES	●	5	89	10	8	55	F	D	0-66 B1 CL 66-84 Sd CL 84-88 F Sd 88-89 Grv Sd * 88-89
685	"	II	4	J. Huston	Hudson	■	36	21	15	1/2	20	F	D	0-21 F Sd * 15
758	"	R II	1	J. Robinson	Marsh	●	10	73	13	1 1/2	45	F	Poultry	0-4 B1 CL 4-35 G1 CL 35-42 CL & Sd 42-73 Sd CL & Sd * 42-70
756	"	R I	1	Humphreys	Dolphin Earl	O	4	60	—	—	—	—	—	0-3 Sd 3-18 R Sd CL 18-60 B1 CL * Dry
771	"	R II	10	Macleay	Lather	●	3 3/8	172	22	2	60	F	D	0-142 G1 CL 142-163 G1 CL & Pbl 163-168 G1 & Sd 168-174 CL & Pbl * 163-168
750	"	R I	9	Hardy	Lather	●	3 3/8	183	27	2	70	F	D	0-150 G1 CL 150-158 F Sd 158-175 Hp 175-183 Grv Sd * 150
745	"	R I	8	Macleay	Dolphin Earl	O	—	200	—	—	—	—	—	0-10 Sd 10-20 R1 CL 20-124 B1 CL * Dry
														184-186 Sd 186-200 Hd G1 R1C
747	"	R I	8	Macleay	Dolphin Earl	●	4	146	35	2	120	F	D	0-10 V1 CL 10-30 B1 CL 130-146 Hp & Grv 146-152 Hd G1 R1C * 142
749	"	R I	8	Macleay	Dolphin Earl	O	4	152	—	—	—	—	—	0-17 V1 CL 17-20 CL & Sd 20-140 B1 CL 140-152 Hp & Grv * Dry

ONTARIO WATER RESOURCES COMMISSION

 AREA OF SURVEY Melbourne

 COUNTY Middlesex

TABLE OF WATER WELL RECORDS

 DATE May 1971

 RECORDER B.M.

Well No.	Location	Owner	Driller	Well Type	Well Diameter INCHES	Depth Feet	Static Level Feet	Pumping Rate GPM	Pumping Level Feet	Quality	Use	Remarks, Log, etc.
743	EKIFRID	Longway	Dolphin Earl	●	4	150	24	7	42	F	Service Station	0-135 Cl 135-150 Grv * 126
744	"	D. Maclean	Dolphin Earl	●	4	155	35	5 1/2	48	F	D	0-95 Cl 95-109 Sd 109-144 Cl 144-150 Sd 150-155 Grv * 155
742	"	D Willey	Dolphin Earl	●	4 1/4	172	5	10	22	F	D	0-160 Cl 160-169 Hd 169-172 Grv * 169
778	"	Johnson	Dolphin Earl	●	4	149	2	10	40	F	D	0-10 Yl Cl 10-126 Bl Cl 126-148 Grv 148-149 Sd * 149
769	"	D Willey	Dolphin Earl	●	4	140	12	5 1/2	18	F	D	0-60 Cl 60-71 Sd 71-90 Slt * 140
741	"	J. Chamberlin	Hudson	□	36	30	7	Too -	Slow -	F		0-30 Bl Cl * Abandoned
736	"	Can. Oil Co.	Brodie & Davis	●	6 1/4	181	6	2	181	F S	Service Station	0-4 Runn 4-14 Fv Sd 14-60 Cl 60-123 Fv Sd 123-125 Fv Grv 125-163 Cl 163-172 Slt Sd 172-181 Slt Bl Sd * E * 119 * 127 * 172
738	"	E Pettit	Hudson	□	36	22	-	-	-	-	-	0-4 Sdy Cl 4-22 Bl Cl * D-1
768	"	F Cuskey	Hudson	□	36	18	-	-	-	-	-	0-10 Runn Cl 10-18 Bl Cl * Dry

ONTARIO WATER RESOURCES COMMISSION

 AREA OF SURVEY Melbourne

 COUNTY Middlesex

TABLE OF WATER WELL RECORDS

 DATE May 1971

 RECORDER B.M.

Well No.	Location	Owner	Driller	Well Type	Well Diameter INCHES	Depth Feet	Static Level Feet	Pumping Rate G.P.M.	Pumping Level Feet	Quality	Use	Remarks, Log, etc.
245	Caradoc	14	E. Carruthers	Smith	5	233	50	10	80	F	D	0-15 Ban C 15-25 B1 C 25-32 F Sol. * 26 32-225 CR & S + W * 233 225-226 1/2 Sd + Water 226 1/2-233 H p 233- Cgd.
247	"	15	S. McRobert	Weaver	1 1/4	20	5	8	-	F	D	0-5 B+N C1 5-10 B+N Qsd * 5 10-20 Gy Qsd
249	"	16	J. McCracken	Weaver	1 1/4	30	11	8	-	F	D	0-15 Open Well 15-30 B+N Qsd * 11
260	"	25	H. McCracken	Weaver	1 1/4	30	12	8	-	F	FARM	0-16 Open Well 16-30 B1K Qsd * 12
388	"	I N 2	R. Carruthers	Hodes	30	104	8	8	28	F	D	0-1 T2 1-17 Ban C * 103 17-103 B1 C 103-115 Silt, Sd
389	"	I N 2	R. Carruthers	Hudson	4 1/2	25	-	-	-	-	-	0-12 B+N C 12-25 B1 C * Dry
390	"	R I N 8	E. Stover	Kather	4	115	-	-	-	-	-	0-2 T2 2-32 Gy C 32-35 Fv Sd * Dry 35-103 Gy C 103-115 Sd + Silt
391	"	R I N 8	E. Stover	Hadco	30	40	18	3	38	F	D	0-6 T2 6-10 B+N C * 20 10-15 B1 C 15-22 B1K Sd 22-40 B1 C
409	"	R I S 2	G. Carruthers	Dolphin Earl	4	158	20	5	120	F	D	0-10 Rd C 10-13 B1 C * 157 13-156 Qsd 156-158 Top R1C
410	"	R I S 3	S. Richards	Dolphin Earl	4	185	35	1	175	F	D	0-15 Y1 C 15-167 B1 C * 173 167-173 Hd R1C 173-185 Silt, Gy R1C

ONTARIO WATER RESOURCES COMMISSION
CHEMICAL LABORATORIES

WATER ANALYSIS

Table 2

All analyses except pH reported in
p.p.m. unless otherwise indicated

1 p.p.m. = 1 mgm. / litre
= 1 lb. / 100,000 lbs. Gals

Municipality: Melbourne, Middlesex Co. Report to: E. R. Campbell - Surveys & Projects 6-40 c.c. A. Redkoop
Central Files

Source: Wells

Date Sampled: Jan. 13/71 by: R. M.

Lab. No.	Hardness as CaCO ₃	Alkalinity as CaCO ₃	Iron as Fe	Chloride as Cl	pH at Lab.	Fluoride as F	Apparent Colour Units	Turbidity Units		
W 2-71	428	420	0.80	62	7.0					
W 2-74	34	172	0.45	223	8.4					
W 2-75	36	142	0.15	10	8.3					
W 2-76	24	198	1.1	247	8.5					
W 2-77	68	190	0.25	160	8.1					
W 2-78	70	138	0.40	199	8.2					
W 2-79	92	122	0.95	269	8.1					
W 2-80	148	100	0.25	338	8.0					
W 2-73	736.		Shell Oil Station		10:40 a.m.			1 of 3		
W 2-74	245.		Shell Oil Station		10:40 a.m.			1 of 3		
W 2-75	684.		Middlesex Turkey Farm		12:15 p.m.			1 of 3		
W 2-76	742.		D. Willey		12:55 p.m.			1 of 3		
W 2-77	769.		H. Welch		1:15 p.m.			1 of 3		
W 2-78	778.		J. Johnson		1:30 p.m.			1 of 3		
W 2-79	750.		Hardy Well		1:50 p.m.			1 of 3		
W 2-80	744.		D. McLean		2:20 p.m.			1 of 3		

CHEMICAL LABORATORIES

WATER ANALYSIS

All analyses except pH reported in
p.p.m. unless otherwise indicated

1 p.p.m. = 1 . gm. / ml.
= 1 lb. / 100,000 Imp. Gals.

Municipality:

Report to:

c.c.

Source:

Date Sampled: Jan. 13/71 by: R.M.

b

Lab No.	NITROGEN COMPOUNDS				Dissolved Solids	Calcium		Magnesium	Potassium	Sodium	Sulphate		
	Free Ammonia	Total Yieldabl	Nitrite	Nitrate		as Ca	as Mg		as K	as Na	as SO ₄		
W 2-23	.13	.46	.003	1.1	620	132	24		61.	29	42		
W 2-24	.32	.55	.002	.02	570	7	4		1.8	217	< 5		
W 2-25	.13	.14	.002	< .01	180	9	3		1.6	57	5		
W 2-26	.35	.43	.003	.03	650	6	2		2.3	252	< 5		
W 2-27	.22	.31	.002	< .01	650	15	7		1.7	218	< 5		
W 2-28	.23	.26	.003	< .01	500	17	7		2.2	159	< 5		
W 2-29	.24	.27	.002	< .01	590	22	9		1.4	189	< 5		
W 2-30	.29	.30	.002	< .01	690	37	13		1.9	195	< 5		

Description on page 1

ONTARIO WATER RESOURCES COMMISSION — DIVISION OF LABORATORIES

BACTERIOLOGICAL REPORT

FILE: Melbourne - Middlesex County - Wells

DATE: ^{SAMPLED} 13 171 ^{ANALYSED} 14 171 ^{REPORTED} 19 171

201067 201074

REPORT TO: F.R.Campbell, Surveys & Projects, 135 St.Clair W., Toronto, Ont.

COPY TO:

PARTICULARS:

LAB NO.

RESULTS PER 100 ML:



201067 736 Shell Oil Station

201067

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
L 4			36

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201068 245 E.Carruthers

201068

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201069 684 Middlesex Turkey Farm

201069

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201070 742 D. Willey

201070

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201071 769 H. Welch

201071

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201072 778 J. Johnson

201072

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201073 750 Hardy

201073

FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

201074 744 D. McLean

201074

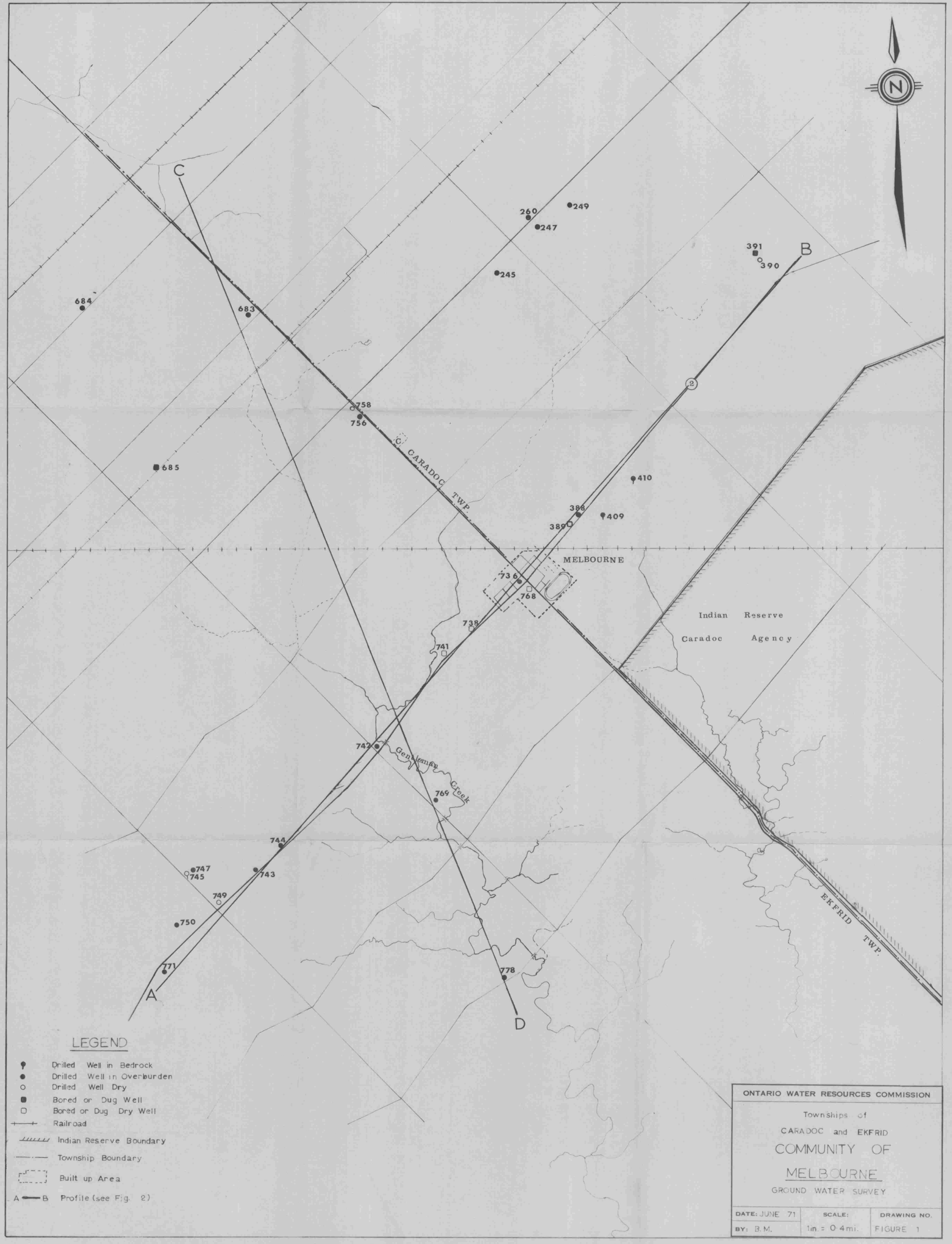
FECAL COLIFORMS	PLATE COUNT	BACKGROUND COLONIES	COLIFORM BACTERIA
0			0

STREPTOCOCCUS	PSEUDOMONAS	CLOSTRIDIUM

+ CHLORINE PRESENT

G & L MEANS GREATER THAN & LESS THAN

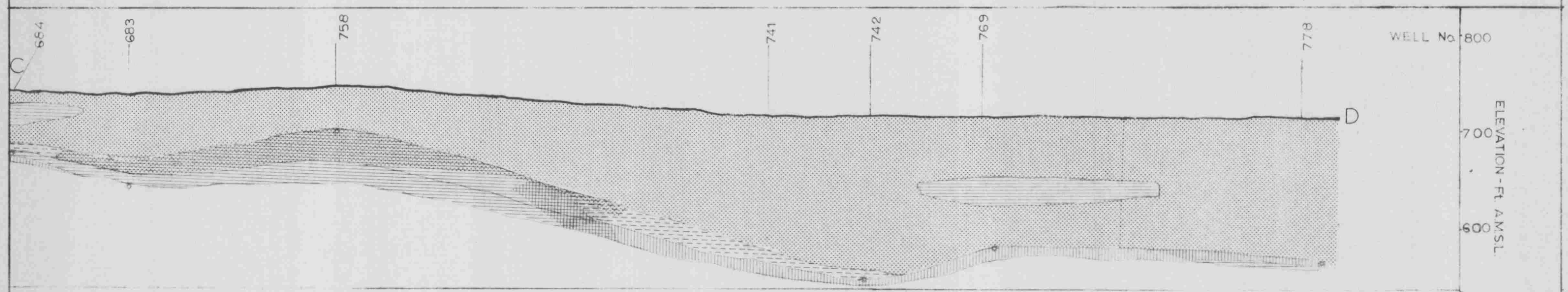
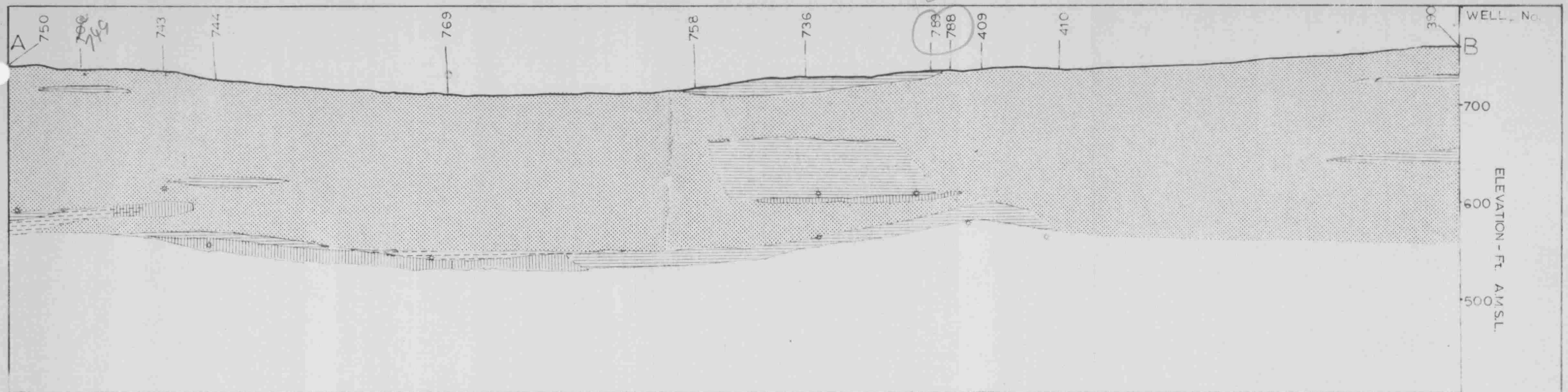
SEE REVERSE SIDE FOR INTERPRETATION



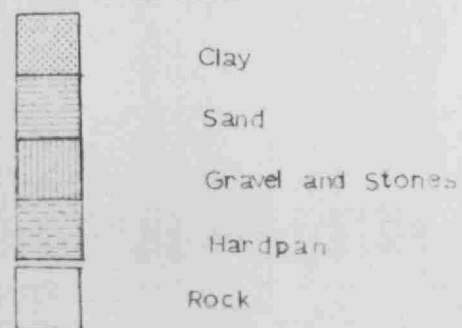
LEGEND

- Drilled Well in Bedrock
- Drilled Well in Overburden
- Drilled Well Dry
- Bored or Dug Well
- Bored or Dug Dry Well
- +— Railroad
- /// Indian Reserve Boundary
- Township Boundary
- - - Built up Area
- A — B Profile (see Fig. 2)

ONTARIO WATER RESOURCES COMMISSION		
Townships of CARADOC and EKFRID COMMUNITY OF MELBOURNE GROUND WATER SURVEY		
DATE: JUNE 71	SCALE: 1 in. = 0.4 mi.	DRAWING NO. FIGURE 1



LEGEND



Depth to Water as Reported by Driller

ONTARIO WATER RESOURCES COMMISSION

Townships of
CARADOC and EKFRID
COMMUNITY OF
MELBOURNE

GROUND WATER SURVEY

PROFILE A-B and C-D

DATE: JUNE 71

SCALE:
Vert. 1 in. = 100 ft.
HOR. 1 in. = .4 mi.

DRAWING NO.

BY: B.M.

FIGURE 2